Soil (and groundwater??) surrounding Unit 6

I. Summary:

The Dichloroaniline Unit (Unit 6) was built in 1990 and was used to produce 1,2 DCA. DCA was produced in this unit from xx, 1987 – xx 1992. Perched Zone groundwater exhibits the highest observed concentrations of 1,2-DCA beneath the former Unit 6 (Figure 5), which indicates the likely presence of elevated 1,2-DCA in soils beneath this unit*(FS Report reference). This building (along with the other on-site buildings) is planned for demolishment. After demolition, the area outlined for remediation (Figure xx) will be more amenable for implementing any of the remediation technologies described below.

II. Evaluation of Alternatives:

A list of each alternative and a brief description is provided below. Also provided are benefits that may be attributed to that specific technology. To help compare each alternative, table xx found in Appendix xx rates how well each alternative meets certain criteria.

Option xx: ***In Situ* Stabilization**:

The *in situ* stabilization (ISS) approach is not intended to remove or destroy COCs in soils, although some loss of VOCs from evaporation during soil mixing is a common ancillary effect of this remedy. Instead, ISS is intended to reduce the leachability and mobility of COCs in soil. With their mobility reduced, COCs are less likely to migrate from soils to groundwater, effectively reducing the source of groundwater impact. Stabilized soils also typically pose a lower risk than unstabilized soils with respect to both vapor intrusion and direct exposure.

ISS would require the removal of all surface improvements (including foundations), pavements, utilities, and other infrastructure in the areas to be treated. Once this removal is completed, soils would be excavated and mixed with a stabilizing material (the stabilant) using specially-equipped augers, trackhoes, or other equipment. This mixing would be performed primarily within the boundaries of the soil excavation. The stabilant may be fly ash, Portland cement, or another pozzolanic material. The preferred stabilant and mix ratios to meet remedial goals would be determined as a part of the Remedial Design process (see Section 10.0). Excavation and mixing would extend to approximately the top of the Perched Zone, at a typical depth of 17 feet.

At the conclusion of ISS, soils would be graded for desired drainage and remain in place within the excavation. Note that ISS often results in a slight volumetric increase in soil volume, so there may be a slight increase in the ground surface elevation within the ISS area. An estimated timeframe to implement this approach is approximately 6 months.

Assuming the stabilant and mix ratios were effective in stabilizing the soils, this approach should reduce the leachability and mobility of soil COCs immediately upon completion. This effect should continue for several decades, depending on the stabilant used. ISS will likely not, however, result in an immediate reduction in groundwater COC levels. Such a reduction should occur, but may require a period of years to observe in the Perched Zone, and even longer in the Alluvial Aquifer.

Stabilized soils may pose less of a threat through direct exposure to future site workers and other receptors, since COCs are more firmly “bound” to the soil particles, and may therefore be less capable of migrating from the stabilized soils to receptors via skin absorption, dust generation, etc. This magnitude of this reduction is, however, difficult to predict until treatability tests are completed.

In summary, ISS would have both good short term and long term effectiveness in reducing the direct contact and vapor intrusion risks posed by soil COCs in the treatment area. It would have low short term effectiveness, but good long term effectiveness in improving groundwater quality at the site. This remedy will have to be maintained in perpetuity to continue to be effective. If the stabilant used begins to break down over time, therefore, it may be necessary to repeat the ISS process to maintain the effectiveness of the remedy.

The cost to perform ISS for the identified areas in Figure 8B is approximately $2.1 Million. Note that these costs do not include the costs of removing buildings and aboveground structures, since those demolition costs are addressed as a part of another remedy element (see Section 7.0 of this FS). These costs do include, however, the removal of slabs, pavement, and other at-grade and below-grade structures from the excavation footprint. There should be no on-going costs for operations and maintenance of the remedy, and no costs for decommissioning the remedy. Costs for a repeat of ISS, if necessary, are not included. A breakdown of these implementation costs is provided in Appendix B.

Option xx: **— Soil Vapor Extraction**

Soil vapor extraction, or SVE, utilizes wells or trenches to extract the air that fills much of the pore space in soils above the water table. As this air is withdrawn, vapor-phase COCs contained in the air are also removed. This removal will continue as evaporation of COCs in the subsurface transfers more chemical mass into the air being removed. SVE is most effective in relatively permeable material, and on volatile chemicals. Ancillary reductions of semi-volatile organics are sometime observed due to biologic action, however, in cases where SVE increases the oxygen content in soil gas.

The primary objective of SVE would be to improve groundwater quality by reducing the mass of VOCs that could ultimately reach Perched Zone and Alluvial Aquifer groundwater. SVE would also reduce vapor intrusion risks at the Facility, by reducing the mass of VOCs that behave as a source of organic vapors. Given the primary objective cited above, SVE is highly amenable technology for areas with elevated VOCs either in soils or in the underlying Perched Zone groundwater

The SVE system configuration under this area is shown in Figure XX. Based on the shallow depth to water and high clay content of soils at this location, SVE will utilize a close extraction well spacing and relatively low vacuum pressures. For the purposes of this RADD, a well spacing of approximately 20 feet and vacuums of approximately 40 inches of water are assumed. The extraction wells will be manifolded to the suction side of an extraction/treatment unit. Water condensing from the extracted vapor will be routed via a moisture knockout system to an aboveground tank. This water will be periodically collected for discharge to the Publicly Owned Treatment Works (POTW) intake at the Facility, subject to approval by the POTW operator.

Depending on the mass and character of VOCs removed and emitted to the atmosphere, it may be necessary to obtain an air emissions permit and/or perform emissions treatment in order to operate an SVE system. Emissions treatment options include activated carbon or thermal oxidation with scrubbing. The need for permitting and emissions treatment is more likely with larger systems (i.e., with the area-wide approach), since most emissions criteria are mass-based, with thresholds set in terms of tons of pollutant per year or pounds of pollutant per day.

The actual system specifications and operating parameters will be developed as a part of Remedial Design (discussed in Section 10.0). This will include any pilot testing and other activities needed to develop a final system design, as well as operating protocols.

The short-term effectiveness of SVE as a remedy at the AOC will likely be poor, due to two factors:

- The Facility soils have a low permeability, so vapor removal from those soils will be slow. This means that the times required to achieve reductions in COC levels in soils and Perched Zone groundwater will be longer than those for a site with more permeable soils.

- SVE is primarily effective on volatile organics, and would not be expected to have any significant effect on the semivolatile or metal COCs present in soils and shallow groundwater.

Over the long-term, by contrast, SVE will likely have good effectiveness in reducing VOC levels in soils, which would be expected to result in a long-term reduction in levels of those COCs in underlying Perched Zone and Alluvial Aquifer groundwater. By reducing VOC mass, SVE will also be effective over the long-term in reducing the potential for vapor intrusion-based risks associated with Facility soils.

Approximately five (5) months would be required to construct the SVE system.

The cost to perform SVE for the identified areas in Figure XX is approximately $2.1 Million. Note that these costs do not include the costs of removing buildings and aboveground structures, since those demolition costs are addressed as a part of another remedy element (see Section 7.0 of this FS). These costs do include, however, the removal of slabs, pavement, and other at-grade and below-grade structures from the excavation footprint. There should be no on-going costs for operations and maintenance of the remedy, and no costs for decommissioning the remedy. A breakdown of these implementation costs is provided in Appendix B.

Because SVE removes COCs from soils, the improvements observed by SVE would be permanent. In summary, SVE used in a localized approach to treat specific VOC source areas would likely have good long-term effectiveness in reducing both soil and groundwater concentrations of those VOCs, and reducing vapor intrusion-related risks.

Option xx: Excavation:

Excavation with off-site disposal permanently removes soil COCs from the Facility, through bulk removal of contaminated soils and their permanent placement in an off-site disposal facility. Excavation with off-site disposal would require the removal of all surface improvements (including foundations), pavements, utilities, and other infrastructure. Once this removal is completed, soils would be excavated and segregated by waste classification (i.e., hazardous vs. non-hazardous). Hazardous and non-hazardous waste soils would remain segregated through the remainder of the remedy process. Soils would be transferred to container trucks and transported from the site to licensed hazardous and non-hazardous solid waste disposal facilities. Excavation would extend to approximately the top of the Perched Zone, at a typical depth of 17 feet.

Soils from the sidewalls of the resulting excavation would be analyzed at completion to confirm that cleanup objectives had been met, with additional excavation as necessary to address any locations identified to still have elevated COCs. As soil removal was completed, the excavation would be backfilled with clean fill. This fill would have to be purchased and imported from a local supplier, since there is no on-site source of backfill. Backfill would be graded for desired drainage. An estimated timeframe to implement this approach is approximately 6 months.

Because the soil COCs within the excavation area would be completely and permanently removed from the Facility, direct contact and vapor intrusion risks would be eliminated or soils within the excavation area. The removed soils would also no longer function as a source of groundwater contaminants. As with ISS, excavation will likely not, however, result in an immediate reduction in groundwater COC levels. It will likely require a period of years to observe water quality improvements in the Perched Zone, and potentially even longer in the Alluvial Aquifer.

In summary, excavation with off-site disposal would have good short- and long-term effectiveness in reducing risk issues associated with direct soil contact, and good long-term effectiveness (but not short-term) in reducing groundwater COC levels. Move to Justification section

The cost to perform excavation with off-site disposal is $11.9 Million. Note that these costs do not include the costs of removing buildings and aboveground structures, since those demolition costs are addressed elsewhere (see Section 7.0 of this FS). These excavation costs do include, however, the removal of slabs, pavement, and other at-grade and below-grade structures from the excavation footprint. There should be no on-going costs for operations and maintenance of the remedy, and no costs for decommissioning the remedy.

A breakdown of these implementation, annual, and decommissioning costs is provided in Appendix B.

Option xx: NFA: NFA implies that nothing would be done to address the COC's. Therefore, no measures would be taken to protect human health and the environment.

Option xx: Soil Cap; a asphalt Cap is listed as alternative to cover the entire area (see section xx). This option can work in concert with one of the above options to help prevent rain water infiltration from carrying contamination into the perched aquifer.

III. Justification for Selection:

The option chosen is option xx – SVE. This option is best suited to address the VOC contamination in the soil. This poses to address contamination better than Options xx and xx. Soil Cap (option xx) will be used in concert with this technology as an extra protective measure to ensure contamination remains stabilized.

IV. Selected Remedy/Site Plan: